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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/814,302	SILVERSTEIN ET AL.	
	Examiner	Art Unit	
	Mia M. Thomas	2609	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-36 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-36 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 01 April 2004 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *see attached*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a) because they fail to show appropriate contrast, detailed images, and concepts of what is presented as applicant's invention for Figures 4-10 as described in the specification. The drawings are not sufficiently describing the invention as it is outlined in the specification. Referring to Figures 4-8 the images presented in this application do not clearly represent the cut lines, "strips", "regions" where the images are supposed to be divided according to the applicant's claimed invention. The overall representation of the "multiple images" in figures 4, 5 and 10 are not clearly defined and exhibit poor contrast, and the multiple examples leading to toward the actual blending claimed in the invention through figures 5-10 are not clearly displayed in the applicant's drawings. It is also unclear concerning the details surrounding Figure 6 relating to the progression of gray scale image processing of the overlapping strips. Additionally, for figures 7-10, it is unclear as to what definition is trying to be detailed in these drawings with regards to the iterative processing, blurred matching and Gaussian warping, concluding with the final blended image. Also, referring to Figure 8, the blurred matching is not depicted at all. Figure 9 does not show how applicant's invention is effected by the Gaussian warping. The final blended image (Figure 10) was not implemented based on this representation of these images. There is no representation in Figures 4-10 of an iterative process, which as claimed would be implemented throughout the invention. Overall, Figures 4-10 are lacking the appropriate contrast to interpret the various objects described in the

specification. Corrective and appropriate contrast printing may assist with these matters. Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims **1-8, 14, 15, 21-36** are rejected under 35 U.S.C. 102(b) as being anticipated by Peterson (US 6,411,742).

Regarding Claim 1, Peterson teaches a method for blending images into a single image ("This invention relates to merging images to form a panoramic image." at column 1, line 6), comprising: selecting two images having overlapping content ("Referring to Figure 2a, images 18 depict overlapping segments of view that are common to all the images." at column 3, line 40); dividing the two images into strips ("...dividing the image into a first section and a second section..." at column 1, line 36); selecting a strip in each of the two images where the two images overlap each other ("...determines the relative positions of the segments depicted in two of the images 18a-18d so that an image of an object depicted in one of the images can be aligned with another image of the same object." at column 3, line 60); determining differences between the overlapping two strips ("...the positioning module 50 of the image stitching software 14 determines the relative positions of the segments..." at column 3, line 59); determining a line through the overlapping strips where the differences between the overlapping strips are minimized (Figure 3c; "The dividing line determiner 54 determines an outline 74 (Fig. 3c)...formed by aligning the current image 18b' and the reference

image 18a…" at column 5, line 25 (e.g. Figure 3a, numeral 214 and 216)); and blending the two images together along the minimized line to create a single image ("Figure 2b is a panoramic image formed by the system of Figure 1 by blending the images of Figure 2a." at column 2, line 55).

Regarding Claim 2, Peterson teaches the selected images belong to a set of two or more images comprising a scene ("For example, images 18a-18d all depict segments of the front view of a house." at column 3, line 41).

Regarding Claim 3, Peterson teaches the selected images differ from each other based on at least recording time, camera location, camera setting, lighting, shadows, or background ("The first image 18a depicts a central segment of the front view and is centered about the entrance to the house. The second image 18b depicts an upper segment of the view to include a balcony 70 on an upper floor of the house, while the third image 18c depicts a left segment of the front view to include a tree 71 located to the left of the entrance." at column 3, line 43).

Regarding Claim 4, Peterson teaches wherein each selected image is divided into at least one strip ("…dividing the image into a first section …" at column 1, line 39).

Regarding Claim 5, Peterson teaches wherein the selected images are divided along a common plane ("Referring to Figure 2c, the determination of the position of the relative segments will be described with reference to the position of the top left corner of the doorway relative to the bottom left corner of each of the images 18a-18d." at column 4, line 9).

Regarding Claim 6, Peterson teaches wherein the selected images are divided into strips along one of a vertical plane or a horizontal plane ("...dividing the image...based on the determined positions..." at column 1, line 39).

Regarding Claim 7, Peterson teaches wherein the two overlapping strips are selected according to a mean squared difference algorithm such that the sum of the mean squared difference values between the two selected strips is minimized ("For example, the top left corner of the doorway is horizontally displaced from the bottom left corner of the image by a distance x0 in the first images 18a, while it is displaced by a distance x1 in the second image 18a.Consequently the second image is displaced to the left of the first image by a distance (d-left) given by the mathematical equation: d-left = x0-x1." at column 4, line 12).

Regarding Claim 8, Peterson teaches cutting the selected images along the minimized line ("Divide panoramic outline into two sections based on line ", at Figure 3a, step 216); and joining the cut images together to create the single image of the scene ("The result of aligning all the images 18a-18d is shown in figure 2e." at column 4, line 38).

Regarding Claim 14, Peterson teaches wherein the blending of images is performed iteratively ("Referring to Figure 2B, image stitching software 14, blends the images 18a-18d so to generate a single panoramic image 26..." at column 3, line 52), with the blended single image being utilized as one of the selected two images to be blended ("If there are more images, the stitching software 14 sets (224) the reference image to be the next image after the current image and repeats the process..." at column 5, line 48).

Regarding Claim 15, Peterson teaches wherein the method of blending is performed iteratively (Figure 2B describes the method of blending images iteratively by blending any of images 18a-18d; "...image stitching software 14, blends the images 18a-18d so to generate a single panoramic image 26..." at column 3, line 52) until all images comprising the scene have been blended into a final single image of the scene ("Consequently, additional processing is required to blend the images into each other and create the near seamless panoramic image 26 (Figure 2B)." at column 4, line 45).

Regarding Claims 21-25, Peterson teaches a computer-based system for blending images into a single image ("Referring to Figure 1, a computer system 10 for blending images 18 has a processor 12 for executing programs..." at column 3, line 11), comprising: a computer configured to (Figure 1, numeral 10): divide two images having overlapping content into strips select a strip in each of the two images where the two images overlap each other (refer to rejection of claim 1, Peterson); determine pixel difference values between the overlapping two strips; determine a line through the overlapping strips where the sum of the pixel difference values between the overlapping strips are minimized (refer to rejected claim 8 , Peterson); and blend the two images together along the minimized line to create a single image (refer to rejected claim 7, Peterson); wherein the two overlapping strips are selected according to a mean squared difference algorithm such that the sum of the mean squared difference values between the two strips is minimized (refer to rejected claim 28, Peterson), wherein the computer is configured to: calculate a squared color difference value for each pixel pair between the overlapping strips (performs the limitations of rejected claim 9 ,Peleg); convert the

squared color difference values into a gray scale image of the overlapping strips (performs the limitations of rejected claim 36 below, Peterson), wherein the brightest pixels in the gray scale image correspond to the pixels of greatest difference between the two overlapping strips (performs the limitations of rejected claim 36 below, Peterson); sort the gray scale pixels from largest to smallest difference value (performs the limitations of rejected claim 36 below, Peterson); for each sorted gray scale pixel, map the gray scale pixel to one of two regions within the overlapping strip according to the adjacency of the sort gray scale pixel to the one of the two regions (performs the limitations of rejected claim 36 below, Peterson); determine a cut line between the two regions (performs the limitations of rejected claim 36 below, Peterson); cut each image along the cut line of the overlapping strip of each image (performs the limitations of rejected claim 36 below, Peterson); and combine the two cut images along the cut line to form the single image (performs the limitations of rejected claim 36 below, Peterson); wherein the cut line is determined by calculating mean squared difference values for pairs of pixels between the two selected image strips(performs the limitations of rejected claim 28 below, Peterson);; wherein at least one of the images is warped where the differences between the selected strips along the cut line exceed a predetermined threshold (performs the limitations of rejected claim 18 below, Xiong); .

It is noted that Figure 1, numeral 10 as taught by Peterson points to a computer system with a processor Figure 1, numeral 13, that can perform multiple tasks in the field of configuration of blended images. It is also noted that the method does not limit the structure of the "computer-based system" claimed in any way. "While features of an

apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429,1431-32, Manual of Patent Examining and Procedures 2114 [R-1] ". The computer-based system as taught by Peterson is capable of and configured to perform the elements claimed by applicant and anticipates the claimed subject matter of claims 21-25.

Regarding Claim 26, Peterson teaches, a system for blending images into a single image ("Referring to Figure 1, a computer system 10 for blending images 18..." at column 3, line 11), comprising: means for dividing two images (Performed by the portion of Figure 1, numeral 54 "...dividing the image into a first section and a second section..." at column 1, line 36); having overlapping content into strips in at least one region of overlap (See Figure 2d; "To align the ... first image 18a and the second image 18b, the two images are overlapped and the second image is displaced ... as shown in FIG. 2D." at column 4, line 30) means for calculating difference values between the pixels of the two images in the at least one region of overlap (Performed by the portion of Figure 1, numeral 50 and 13 "The other images 18c and 18d are also overlapped and displaced in a similar fashion to align the pixel representing the top left comer of the doorway in one image to other pixels representing the same comer of the doorway in other images. The result of aligning all the images 18a-18d is shown in FIG. 2E." at column 4, line 34); means for determining a cut line through the two images where the difference values are minimized (Performed by the portion of Figure 1, numeral 54; "Consequently, additional processing is required to blend the images into each other

and create the near-seamless panoramic image 26 (FIG. 2B)." at column 4, line 45); and means for blending the two images along the cut line to create a blended single image (Performed by the portion of Figure 1, numeral 58"Referring to FIGS. 3A-3C, a process for blending images implemented by the computer system of FIG. 1 will be described using the images 18a-18d as examples." at column 4, line 65).

Regarding Claim 27, Peterson teaches a system for blending images into a single image ("Figure 1 is a block diagram of a system for blending images of overlapping segments of view..." at column 2, line 51), comprising: a first computing module dividing two images having overlapping content into strips in at least one region of overlap (Performed by the portion of Figure 1, numeral 13; "The process begins when the image capture software 12 (FIG. 1) captures (200) the images 18 (FIG. 1) that are to be blended. The positioning module 50 (FIG. 1) determines (202) the position of the segment of the view corresponding to the each image 18b-18d relative to the segment of the view corresponding to the first image 18a (as previously described with reference to FIGS. 2C and 2D)..." at column 4, line 67); a second computing module calculating difference values between the pixels of the two images in the at least one region of overlap (For example, "Referring to Figure 1, the positioning module 50 of the image stitching software determines the relative positions of the segments..." at column 3, line 59); a third computing module determining a cut line through the two images where the difference values are minimized (For example, "The dividing line determiner 54 then determines which of the two sections has less of the current image 18b' that is not overlapped by the reference image 18a and sets (220) that section of the current image

to be invisible." at column 5, line 36); and a fourth computing module blending the two images along the cut line to create a blended single image (For example, "The blending mask determiner smoothes the intersection between the region 82 with pixel values set to 1 and the region 84 with pixel values set to 0..." at column 5, line 60). It is noted that the processor, Figure 1, numeral 13 of the computer based-system of Peterson is capable of performing and possessing the computing modules of claim 27. It is also noted that the subject matter of claim 1 and 16 does not limit the structure of the claimed computer based system of claim 27.

Regarding Claim 28, Peterson teaches, the system including selecting two overlapping strips according to a mean squared difference algorithm such that the sum of the mean squared difference values between the two strips is minimized (Performed by the portion of Figure 1, numeral 50) "If the outlines of the aligned images intersect at more than two points, the dividing-line determiner 54 selects the two intersection points that are furthest apart from each other to define the dividing line 80." at column 5, line 32).

Regarding Claim 29, Peterson teaches, the system including: a fifth computing module cutting the two images along the cut line (Performed by the portion of Figure 1, numeral 54); and a sixth computing module joining the cut images together to create the single image (Performed by the portion of Figure 1, numeral 58; "Determining the position of the segment depicted in the second image relative to the segment in the first allows the method to blend images that may represent segments of the view that are arbitrarily positioned relative to each other. It also allows the method to blend images that may have arbitrary shapes and sizes." at column 1, line 51).

Regarding Claim 30, Peterson teaches, the system wherein at least one of the cut images is warped along the cut line to improve the fit between the two images along the cut line (Performed by Figure 1, numeral 56; "Refer to Figure 2b; "Thus, the image stitching software 14 allows a user to blend multiple images 18a-18d to create a panoramic image 26 with a field of view that is larger than the field of any one of the multiple images." at column 3, line 52).

Regarding Claim 31, Peterson teaches, the system wherein the blending of images is performed iteratively, with the blended single image being utilized as one of the two images to be blended ("The stitching software 14 checks (222) whether there are any more images between the reference image 18a and the current image 18b'. If there are more images, the stitching software 14 sets (224) the reference image to be the next image after the current reference image and repeats the process of setting a section of the current image 18b' invisible 208-220 described above." at column 5, line 46).

Regarding Claim 32, Peterson teaches, the system wherein the system is included in one of a video camera or a digital camera ("For example, the image 18 to be blended may be obtained from a digital camera, storage 16, or a network 26." at column 7, line 17).

Regarding Claims 33-36 Peterson teaches, a computer readable medium encoded with software for blending images into a single image, wherein the software is provided for selecting two images having overlapping content; dividing the two images into strips where the two images overlap each other; selecting a strip in each of the two images; determining the differences between the overlapping two strips; determining a line

through the overlapping strips where the differences between the overlapping strips are minimized; and blending the two images together along the minimized line to create a single image; **(claim 34),** the software according to claim 33, wherein the selected images differ from each other based on at least recording time, camera location, camera setting, lighting, shadows, or background; **(claim 35)**, the software according to claim 33, wherein the two overlapping strips are selected according to a mean squared difference algorithm such that the sum of the mean squared difference values between the two strips is minimized; **(claim 36),** Peterson teaches, the software according to claim 33, wherein the software is provided for: calculating a difference value for each pixel pair between the two overlapping strips; converting the calculated difference values into a gray scale image of the overlapping strips, wherein the brightest pixels in the gray scale image correspond to the pixels of greatest difference between the two overlapping strips; sorting the gray scale pixels from largest to smallest difference value; for each sorted gray scale pixel, mapping the gray scale pixel to a first region or a second region within the overlapping strip according to the adjacency of the gray scale pixel to the first region or the second region; determining a cut line within the overlapping strips between the first mapped region and the second mapped region; cutting each selected image along the cut line of the overlapping strip of each selected image; and combining the two cut selected images along the cut line to form the single image ("In general, another aspect of the invention relates to an article that includes a computer readable medium, which stores computer-executable instructions for blending

images of segments of a view according to the method described above." at column 1, line 46).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims **16 - 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Peterson (US 6,411,742) in combination with Xiong (US 6,549,651 B2).

Peterson teaches the elements of claim 1 as stated in the 102 (b) rejection above. Peterson does not disclose dividing two images into strips along a common plane and warping the single image to minimize blurring along the blending line.

Regarding Claim 16, Xiong teaches a method for blending two images into a single image ("...to provide an improved system and method for blending...of a plurality of rectilinear images." at column 1, line 65), comprising: dividing two images into strips along a common plane ("The images are assumed to roughly share a common nodal point..." at column 4, line 57) (e.g. Figure 11a)); selecting a strip in each image where the two images overlap (Figure 3, numeral 314); determining a line through the overlapping strips where differences between the overlapping strips are minimized ("The objective is to minimize the overall image discrepancies in all overlap regions while converting projective matrices..." at column 2, line 13); blending the two images along the determined minimized line to create a single image ("The present invention is

designed to ...align all such 2D rectilinear images with respect to one another and globally blend the images where they overlap...shown conceptually in 2D form as Figure 1(b), for any arbitrary geometry." at column 3, line 47); and warping the single image to minimize blurring along the blending line ("Where the images overlap there is potential for misalignment when constructing a 3D panorama, as indicated by blurry line 112, and for a variety of reasons, including the arbitrary position of the camera, errors in internal and external camera parameters, and, distortions that occur when warping a 2D image to construct a 3D image space." at column 3, line 41).

It would have been obvious at the time that the invention was made to add dividing two images into strips along a common plane and warping the single image to minimize blurring along the blending line of claim 16 as taught by Xiong to the elements of claim 1 as stated in the 102 (b) rejection above. as taught by Peterson because warping the images along a common plane while utilizing a minimized line allows the user of this method to form, shape, bend and stretch the images to obtain a best match for providing a seamless match of a blended single image.

Peterson teaches the elements of claim 1 as stated in the 102 (b) rejection above. Referring to Claims 17 and 18, Peterson does not disclose [that] the minimized line is determined by calculating mean squared difference values for pairs of pixels between the two overlapping image strips nor wherein at least one of the images is warped where the differences between the selected strips along the blending line exceed a predetermined threshold.

Regarding Claim 17, Xiong teaches wherein the minimized line is determined by calculating mean squared difference values for pairs of pixels between the two overlapping image strips ("Different combinations of overlapping areas are tried to achieve the optimal overlap between images (or, equivalently, the smallest error in the error function or pair wise objective function described herein) using the steps described herein, which generally minimizes the average squared pixel intensity (e.g., brightness and contrast) difference with respect to certain transformation parameters." at column 4, line 65).

Regarding Claim 18, Xiong teaches wherein at least one of the images is warped where the differences between the selected strips along the blending line exceed a predetermined threshold (Where the images overlap there is potential for misalignment when constructing a 3D panorama, as indicated by blurry lines 112, for a variety of reasons, ... distortions that occur when warping a 2D image to construct a 3D image space. The present invention is designed to calibrate and align all such 2D rectilinear images with respect to one another and globally, blend the images where they overlap, and construct a reconstructed and relatively error free 3D panorama image, shown conceptually in 2D form as FIG. 1(b), for any arbitrary geometry." at column 3, line 41). It would have been obvious to add further the elements of claims 17 and 18 to the method of blending images as taught by Peterson because the addition of these limitations of claims 17 and 18 provide robust computational elements to the claimed method. The calculation of the mean squared difference values creates a larger

calculation field for the image stitching software, Figure 1, numeral 14 as taught by Peterson.

Referring to Claims 19 and 20, Peterson does not disclose [a] single image is [being] warped by application of a Gaussian function nor where the Gaussian function is applied iteratively along a plurality of planes and with a plurality of magnitudes of warp to determine the best fit between the images.

Regarding Claim 19, Xiong teaches wherein the single image is warped by application of a Gaussian function ("The Gaussian pyramid may be constructed by applying a low-pass filter to the blend mask, which dilutes the sharp edges, from linear interpolation between the black and white regions of the blend mask, or from other techniques." at column 15, line 48).

Regarding Claim 20, Xiong teaches where the Gaussian function is applied iteratively along a plurality of planes and with a plurality of magnitudes of warp to determine the best fit between the images ("The local pair wise registration module 222 iterates until the entire Gaussian pyramid is traversed...and working out the finest level resolution, as indicated in decision box 324." At column 5, line 27).

It would have been obvious to add a Gaussian function, which by application warps the images as taught by Xiong to apply the iterative operation of the blending as stated previously to create the most user friendly and computationally straightforward method of computing these operations. Allowing the user to warp the images using the Gaussian function as taught by Xiong also shows that "though 3D modeling via equations, [the user] has certain advantages, such as a depiction of a scene from any

arbitrary vantage point, creating images from equations generated by a computer is seriously limited by the speed of the computer." (Xiong column 1, line 31)

6. Claims **9,10,11,12,13** are rejected under 35 U.S.C. 103(a) as being unpatentable over Peterson (US 6,411,742) in combination with Xiong (US 6,549,651 B2) and Peleg et al. (US 6,434,280 B1).

Peterson teaches the claimed elements of claims **1-8, 14,15, 21-36** in the 102(b) rejection above. Peterson also teaches the claimed elements of claims 10 and 11. Xiong in combination with Peterson, in the same field of blending multiple images into a single image teaches the claimed elements of claims 16-20 as described in the 103(a) rejection above. Xiong also teaches the elements of claims 12 and 13. Peleg in combination with Peterson and Xiong teaches the claimed elements of claims 9. Peterson in combination with Xiong does not fully disclose calculating a squared color difference value for each pixel pair between the overlapping strips; converting the squared color difference values into a gray scale image of the overlapping strips, wherein the brightest pixels in the gray scale image correspond to the pixels of greatest difference between the two overlapping strips; sorting the gray scale pixels from largest to smallest difference value; for each sorted gray scale pixel, mapping the gray scale pixel to one of two regions within the overlapping strip according to the adjacency of the gray scale pixel to the one of the two regions.

Regarding Claim 10, Peterson teaches, wherein the cut line is determined between a first region and a second region to which the pixels have been mapped ("The second

image is divided into the first and second section by a dividing line that is determined based on an outline of the first image..." at column 2, line 22).

Regarding Claim 11, Peterson teaches wherein the cut line corresponds to the line of best match between the overlapping strips ("For example, a seam 62 is created...where the two images 18c and 18d join each other...and create a near seamless panoramic image 26 (Figure 2b) ", at column 4, line 42).

Peterson teaches the elements of claims 1-8, 14, 15, 21-36 in the 102(b) rejection above. Peterson also teaches the elements of claims 10 and 11. Xiong teaches the elements of claims 16-20. Peterson in combination with Xiong does not disclose the claimed elements of claim 9.

Regarding Claim 9, Peleg teaches: calculating a squared color difference value for each pixel pair between the overlapping strips; ("The computer system 10...can perform processing operations..."at column 3, line 46, ") converting the squared color difference values into a gray scale image of the overlapping strips, ("If the image frames 20(n) are in color form, the image data associated with the color space components can be processed separately..."at column 5, line 19); wherein the brightest pixels in the gray scale image correspond to the pixels of greatest difference between the two overlapping strips ("If, for example, eight bits are used for each pixel, two hundred and fifty six (that is, (2^8) intensity values may be represented for each pixel, extending from, for example, zero for a black pixel to two hundred and fifty five for a white pixel." at column 5, line 8); sorting the gray scale pixels from largest to smallest difference value ("It will be appreciated that the number of possible intensity values that may be represented for

each pixel will depend on the number of digital data bits which are used in the representation of the pixel value associated with the pixel." at column 5, line 4); for each sorted gray scale pixel, mapping the gray scale pixel to one of two regions within the overlapping strip according to the adjacency of the gray scale pixel to the one of the two regions ("In either case, the digital data representing image frames 20(n) may be provided to the computer 10...If the image frames 20(n) are in monochrome form, such as in gray scale form, the pixel value associated with each pixel will generally comprise a single numerical value that identifies the intensity level of the region of the respective image frame with which the pixel is associated..." at column 4, line 65); determining a cut line between the two regions ("In that process, the super-resolution generator divides the mosaic image into a plurality of patches..." at column 3, line 2); cutting each selected image along the cut line within the overlapping strip of each selected image (See Figure 3a, numerals 100-104; "After generating enhanced resolution mosaic image in step 106, the super-resolution processor 24 performs the super-resolution operation in connection with each of the patches and the image frames 20(n) associated therewith." at column 7, line 5); and combining the two cut selected images along the cut line to form the single image ("In accordance with the invention, ... generates from the image frames 20(n), the super-resolution-enhanced mosaic image 22 as a single mosaic image... with improved image quality and resolution..." at column 5, line 55). At the time that the invention was made, it would have been obvious to add calculating a squared color difference value for each pixel pair between the overlapping strips; converting the squared color difference values into a gray scale image of the

overlapping strips, wherein the brightest pixels in the gray scale image correspond to the pixels of greatest difference between the two overlapping strips; sorting the gray scale pixels from largest to smallest difference value; for each sorted gray scale pixel, mapping the gray scale pixel to one of two regions within the overlapping strip according to the adjacency of the gray scale pixel to the one of the two regions to the method of blending images into a single image as taught by the combination of Peterson and Xiong because the calculation of the squared color difference values for each pixel allows the user to align the images more efficiently and according to Peleg, "alignment is most important along the seams and in the areas where pixels differences are easily determined."

Peleg teaches the elements of the rejected claim 9 above. Peleg does not disclose wherein at least one of the cut images is warped along the cut line to improve the fit between the two cut images along the cut line nor wherein a Gaussian function is used to warp the at least one cut image.

Regarding Claim 12, Xiong teaches wherein at least one of the cut images is warped along the cut line to improve the fit between the two cut images along the cut line ("The present invention is designed to calibrate and align all such 2D rectilinear images with respect to one another and globally, blend the images where they overlap, and construct a reconstructed and relatively error free 3D panorama image, shown conceptually in 2D form as FIG. 1(b), for any arbitrary geometry." at column 3, line 47).

Regarding Claim 13, Xiong teaches wherein a Gaussian function is used to warp the at least one cut image ("The third step re-projects all images...by employing Laplacian pyramid based blending using a Gaussian blend mask..." at column 2, line 18).

It would have also be obvious at the time that the invention was made to add the application [wherein] at least one of the cut images is warped along the cut line to improve the fit between the two cut images along the cut line and wherein a Gaussian function is used to warp the at least one cut image. as taught by Peleg to at least one cut images which is warped by a Gaussian function as taught by Xiong because the alignment of the overlapping strips or regions, determined by calculating the pixel pairs or pair-registration, because this application allows the user to bend, shape or warp the image to the most correct alignment presented after the super-resolution is generated. The purpose of the blending using the Gaussian function is "to provide a smooth transition between images and eliminate small residues of misalignments resulting from parallax or imperfect pair wise registrations." (Xiong, column 2, line 21)

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mia M. Thomas whose telephone number is 571-270-1583. The examiner can normally be reached on Monday-Friday 7:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Werner can be reached on 571-272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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